Geophysical Research Abstracts
Vol. 15, EGU2013-11271, 2013
EGU General Assembly 2013

Velocity and structural model of the Lower Tagus Basin according to the study of environmental seismic noise

Ricardo Jorge Gomes Torres (1), José Augusto Furtado (1), Hugo Gonçalves Silva (1), José Fernando Borges (1,2), Bento Caldeira (1,2), Mourad Bezzeghoud (1,2), João Carvalho (1,3)

(1) Centro de Geofísica de Évora, Universidade de Évora, Évora, Portugal , (2) Departamento de Física, Universidade de Évora, Portugal , (3) Laboratório Nacional de Energia e Geologia, Portugal

Along his history the Lower Tagus Valley (LTV) region was shaken by several earthquakes, some of them produced in large ruptures of offshore structures located southwest of the Portuguese coastline. Among these is the Lisbon earthquake of 1 November 1755 (M∼8.5-8.7), and other moderates earthquakes that were produced by local sources such as the 1344 (M6.0), 1531 (M7.1) and 1909 (M6.0) earthquakes.
Previous simulations [1] have shown high velocity amplification in the region. The model used in the simulations was updated from low to high resolution using all the new available geophysical and geotechnical data on the area (seismic reflection, aeromagnetic, gravimetric, deep wells and geological outcrops) [2].
To confirm this model in the areas where it was derived by potential field methods we use broadband ambient noise measurements collected in about 200 points along seven profiles on the LTV basin, six perpendicular and one parallel to the basin axis. We applied the horizontal to vertical (H/V) spectral ratio method [3] to the seismic noise profiles in order to estimate the distribution of amplification in the basin. The H/V curves obtained reveals the existence of two low frequency peaks centered on 0.2 and 1 Hz [4]. These peaks are strongly related with the thickness of Cenozoic and alluvial sediments. The velocity model obtained by inversion of the H/V curves is in good agreement with borehole data, and results obtained using seismic reflection and gravimetric methods. However, aeromagnetic data overestimates the depth of the base of Cenozoic in the areas where it overlies directly the paleozoic basement, which we attribute either to the existence of Mesozoic units or higher magnetic susceptibilities than expected for the Paleozoic.

References:
[1] Bezzeghoud, M., Borges, J.F., M., Caldeira (2011). Ground motion simulations of the SW Iberia margin: rupture directivity and earth structure effects. Natural Hazards, pages 1–17.
doi:10.1007/s11069-011-9925-2
[2] Torres, R.J.G., (2012). Modelo de velocidade da Bacia do Vale do Tejo: uma abordagem baseada no estudo do ruído sísmico ambiental, Master Thesis, Universidade de Évora, 83pp.
[3] Nakamura, Y., 1989. A method for dynamic characteristics estimations of subsurface using microtremors on the ground surface, Quarterly Report, RTRI, Japan, v. 30, p. 25-33.
[4] J.A. Furtado, Confirmação do modelo da estrutura 3D do Vale Inverior do Tejo a partir de dados de ruído sísmico ambiente, Master Thesis, Universidade de Évora, 136pp, 2010.